MEETING MINUTES (FINAL)

CITY OF TUCSON HABITAT CONSERVATION PLANS (HCPs)
Technical Advisory Committee (TAC)
Wednesday, June 17, 2009, 1:00 – 4:00 p.m.
U.S. Fish & Wildlife Service, Tucson Field Office
201 North Bonita Avenue, Suite 141
Tucson, Arizona 85745

ATTENDEES

City of Tucson (COT) Habitat Conservation Plans (HCPs) Technical Advisory Committee (TAC) members present:
Dennis Abbate (Arizona Game and Fish Department – Research Branch)
Marit Alanen (U.S. Fish & Wildlife Service)
Rich Glinski (Arizona Game and Fish Department – *retired*)
Paul Green (Tucson Audubon Society)
Trevor Hare (Coalition for Sonoran Desert Protection)
Ries Lindley (City of Tucson – Tucson Water Department)

Other Attendees, including *ex-officio* TAC members, present:
Ann Audrey (City of Tucson – Office of Conservation and Sustainable Development)
Jamie Brown (City of Tucson – Office of Conservation and Sustainable Development)
Mike Cross (Westland Resources, Inc.)
Locana de Souza (Arizona Game and Fish Department)
David Jacobs (Arizona State Land Department / Arizona Attorney General's Office)
Leslie Liberti (City of Tucson – Office of Conservation and Sustainable Development)
Shawn Lowery (Arizona Game and Fish Department – Research Branch
John Wise (Stantec)
Bill Zimmerman (Pima County Regional Flood Control District)

1. Welcome, introductions, and ground rules

After introductions, Jamie reminded the group that, per Technical Advisory Committee (TAC) member request, non-TAC members could add their comments to the discussion during the Call to the Audience portion of the meeting.

2. Review of May TAC meeting minutes

Minutes were approved with comments and edits from Trevor and Rich.

3. Discussion

<u>Arizona Game and Fish Department recent studies: Lesser Long-nosed Bat and Tucson Shovel-nosed Snake (Shawn Lowery):</u>

Shawn began by sharing information about the Arizona Game and Fish Department's (AGFD's) planning level surveys of Tucson shovel-nosed snake (TSS) on Florence Military Reservation (FMR). He said that the purpose of the project was to evaluate potential TSS habitat on the FMR and use the information to plan some surveys to document the presence of TSS. They had reports of TSS on the property and so they wanted to better understand TSS use of these lands. He said that AGFD Region 6 has been doing roadkill surveys along Highway 79 since 2002. Bill Burger and Randy Babb have been running that project, collecting data every year (April through June). When asked who funded Mr. Burger and Mr. Babb's TSS work, Shawn said that it was part of their AGFD regional responsibilities.

In terms of an overview of the study area, Shawn said that FMR has been constricted considerably from what it used to be in terms of size. He believes that the Arizona State Land Department (ASLD) may have revoked an FMR lease of lands to the north. The southern portion of the FMR is where the activity of the FMR mission occurs. The north end of the FMR is characterized by creosote flats and alluvial deposits. As one moves south, one can see the Central Arizona Project (CAP) canal and the land flattens out before reaching the Gila River.

Shawn said that AGFD staff essentially followed the model developed by Dr. Phil Rosen, which used the variables of land use, elevation, and soil type. They revised the model by using soil series, which provides more information about the horizons and takes into account the slope. Suitable habitat characteristics included in the model were elevations lower than 640 meters, loamy clay/sandy clay soils, and slopes less than 5%. He said that they used that model to develop a map of predicted habitat on the FMR. The model incorporates what was historically the FMR, so it went beyond the study area. Shawn said that the reason this was done was to incorporate some of the roadkill data that Mr. Burger and Mr. Babb had been collecting. He said that the model agrees well with the roadkill data.

Shawn said that the roadkill data helped to validate their model, providing confidence that the model matched up well with data that was previously collected. Given this confidence in the model, they deployed 12 trap arrays consisting of an L-shaped design, 150 feet on each side. Three pitfall traps were dug, one on each end and one at the 90-degree turn of the L-shaped array. In addition, they used funnel traps, dispersed on either side of the fence, halfway between the turning point and the terminal ends of the trap arrays. Shawn said that trapping occurred during the heavy TSS activity period, which is mid-April through mid-June. AGFD staff did three survey events, lasting 15 days each, and checked each trap every day. In addition, they performed roadkill analysis on the southern end, up Highway 79, across the CAP canal. For the roadkill analysis, they surveyed the areas by riding on all terrain vehicles along the shoulder, going extremely slowly to pick up as many detections as possible. These occurred very early in the morning prior to any scavenging that would skew results. They tried to avoid double counting by marking each individual.

In terms of lessons learned, Shawn said that most suitable habitat for TSS on FMR was identified and surveyed. During their effort, 28 TSS individuals were documented. Unfortunately, 23 of those were roadkill mortalities. So, they observed five live individuals on the FMR. All of the mortalities were along highway 79. Where the trap arrays were deployed is where the TSS failed to negotiate the highway. So, this number suggests that a sizable TSS population exists on FMR

and efforts can be made to keep this population viable in the future. These data were provided to the Arizona Department of Transportation (ADOT). However, ADOT does not currently have any projects planned for this particular highway segment so that the roadway could be designed to decrease TSS mortality. However, according to ADOT staff, it sounds like when a highway improvement project is considered for this area, they will work to incorporate mitigation measures, such as installing culverts to minimize TSS mortality in this area. Shawn said that the "take home message" from this study is that roadways have a significant, negative impact on TSS. Trevor asked if the National Guard could do some mitigation. Shawn said that the National Guard does not own any of that land immediately adjacent to the highway; it's owned by ADOT and is therefore, their responsibility.

Marit asked if any studies demonstrate that TSS uses culverts. He said that he didn't know of any study that actually documented TSS using these culverts. However, given that there is adequate substrate, he doesn't know why they would avoid them. The challenge would be to maintain the proper substrates over time. Avoiding areas where drainage would be a problem could minimize sediment scour.

Jamie said that, as part of the Avra Valley HCP, the City will monitor TSS habitat and wondered if Shawn had any recommendations for long-term monitoring of TSS habitat in terms of degradation. Shawn said that Phil's model does a good job of identifying TSS habitat. He added that these areas were not formerly farmed and, therefore, the soils allow for TSS movement. Jamie asked if Shawn would recommend taking soil samples in the modeled habitat or if that would be unnecessary as long as the soils are not impacted by human activity. Shawn said that the soils should remain generally intact as long as there is TSS presence there today, he assumes they would persist in those areas.

Ries asked if there have been other studies where both roadkill surveys and trap arrays were used. Shawn said that he didn't know of any. He said that a majority of the TSS data available is on road mortality. Trevor referred to a study in Organ Pipe Cactus National Monument that involved the effect area of roads. He said he believed this involved roadkill surveys and pitfall traps. The study he was recollecting was from the mid-1990s and was by Rosen and Lowe. Ries said that he asked because he wondered if there were enough traps, if one could probably get an estimate of traffic volume and speed. Trevor said that Rosen did population estimates and, based on the roadkill studies, he recommended a 35-mph speed limit.

<u>Lesser long-nosed bat movement study:</u>

Shawn said that the purpose of the project was to determine lesser long-nosed bat (LLNB) movement patterns, flight corridors, location of foraging patches, and night roosts, in and around the City of Tucson and the Town of Marana for their Habitat Conservation Plan (HCP) processes. The study area was within the City of Tucson (Greater Southlands) and Town of Marana HCP study areas. Shawn and his team expanded the planning area to include the urban areas between these HCP planning areas.

In terms of trap site selection, Shawn reported that a network of volunteer, citizen scientists participated. They stayed up late counting LLNB at hummingbird feeders and sending Shawn

numerous e-mails documenting the measurements of the fluid throughout the evening. Shawn said that his team trapped where volunteers were documenting the presence of LLNB at hummingbird feeders. He noted that sampling was not uniformly distributed across the Tucson Basin. However, he said that distribution of detections was very similar to a study conducted by Sandy Wolf in 2006 in which she monitored hummingbird feeders. Shawn said that he believes that Scott Richardson (USFWS) has a public version of Ms. Wolf's report. *[Action Item: OCSD staff request Sandy Wolf's 2006 nectar feeding bat study and send to TAC]*. Shawn displayed a map showing the monitoring network within the Tucson Basin. He said that the study occurred from 2006 to 2008, but that the 2006 year was not funded. During that first year, they just captured a couple of LLNB to determine the feasibility of tracking the bats. Shawn referred to a map from Sandy Wolf's study of LLNB, which indicated the location of monitors that detected the presence of LLNB. Upon reflection, Shawn said he wonders if there was sampling error related to the distribution of the monitors. For instance, maybe there were bats in the urban core, but there were no monitors in the area. However, Shawn said that his study shows that the areas where AGFD staff got detections were similar to those in Sandy Wolf's investigation. He said that is because that is where the bats are.

In terms of telemetry methods, Shawn said that they trapped LLNB from August through October at feeder sites. Radio transmitters were fitted to the LLNB using skin bond glue. Trevor asked if the bat had to be shaved. Shawn said that he is not an advocate for shaving that portion of the bats because it is fairly traumatic to the individual. Instead, he said that he finds advantages to mixing the glue into the bat's hair and folding it over the transmitter. They had one female during the study for which the transmitter was lost. They conducted radio telemetry using vehicles. Tracking crews followed individuals from immediately after release to the morning when the bat returned to the roost. Triangulation events were recorded every 5-10 minutes when they were in their core area or home range. When they were in core forage area, they were recorded every ten minutes or whenever they had a good signal. Triangulation occurred over four consecutive nights, but their goal was to increase the number of bats tracked and not necessary follow the bats throughout the duration of the life of the transmitter. Shawn noted that the battery power of the transmitter can last up to 21 days and the skin bond glue can hold up to 14 days. There were a couple of situations where they detected a bat exiting a roost after they had moved on to track another bat. The longest duration of detecting a bat coming out of a roost was 10 days from the day they trapped it to the day the detected it exiting. Marit asked how far away they could be with the receiver to detect the transmitter. Shawn said up to 10 km. He added that the six yagi antennas they used were very effective.

Shawn said that they documented four day roosts in the Santa Catalina Mountains, Rincon Mountains, and Empire Mountains. They also located two roosts that were previously unidentified. Roost fidelity -- the tendency to return to a specific site -- was 77% for the same day roosts. So, Shawn said that they had pretty tight fidelity in terms of roost switching. Flight corridors between foraging areas and day roosts in Tucson areas were identified. He said that he didn't think they ever recorded a bat moving to a new forage site in those four consecutive nights they followed the bat. Each night, it would return to the same forage area. He said that there is a wide variety of night roosts that they identified, including trees and barns. Due to roost site sensitivity, Shawn said that land management agencies interested in those specific locations could contact the AGFD Heritage Data Management System to get that information.

Shawn said that mean distance traveled by the tracked LLNB in 2007 was 18 miles. In 2008, it was 5.8 miles. He continued by saying that, in 2008, they identified new roosts that hadn't been used by LLNB in the previous year. While they sampled in the same foraging area, there was a brand new roost and every bat that they tracked seemed to return to that roost. This helps explain the large change in mean distance traveled. Referring to a photo of a roost in the Santa Catalina Mountains, he described it as a natural cave about 5 meters deep that then extends upward about 12 meters to a vaulted, narrow slit. As they approached it, they knew where it was not just by the transmitter, but by the smell of bat guano as well.

Trevor asked if there were signs of human disturbance at this new roost. Shawn said that there were some signs of human activity, but he said that the roost is not near a trailhead. When they got to the roost, they found a sign left by Ronnie Sidner, a local mammalogist and bat expert, who left a data logger. Shawn said that he worked with her several years ago when they developed a habitat criteria model for roosts. She had deployed the data logger to create a similar data set. However, she didn't know that there were LLNB in that roost. At the time she identified that roost, it was *Choeronycteris mexicana* that were using it as they had trapped that site for *Choeronycteris mexicana.*

Marit asked if they were able to get a signal from a bat in that cave. Shawn said that he detected it almost by chance, after he was walking back to his vehicle. He said that normally, as soon as the bats go underground, the signal is lost.

In terms of travel rates, Shawn said that they calculated that based on the time between when the LLNB arrived at the foraging area from the time they left their roosts. These ranged from 10-20 miles per hour to the foraging area and 11-16 miles per hour on the return flight. Straight-line flights were not observed for all individuals. Shawn said that energetics would dictate that the best way to get from one point to another is a straight line. This suggests that the LLNB were selecting for or against something when moving through the landscape. So they decided to use compositional analysis to look at various components that they anecdotally identified in the field as they were doing the study. One of these components was proximity to washes and the other was light.

Shawn took 95 percent of the data, fitted it to a minimum confidence polygon, and that became the study area for their analysis. He said that the initial hypothesis with compositional analysis is that use is proportional to what is available. So, those points that they detected should be proportional to what is available in, for example, distance to washes. The results showed that movements were not random and, therefore, the null hypothesis was rejected. There was direct selection for areas closest to washes. He said that up to two kilometers away, LLNB were selecting for washes and at four kilometers away, LLNB were selecting against washes.

The same compositional analysis approach was used with lighting data. He wanted to use nighttime satellite imagery of Tucson and examine the pixels, but unfortunately, he said that that did not exist when he did this analysis. There are some images available, such as from the National Oceanic and Atmospheric Association (NOAA). However, distortion from light refraction in the atmosphere causes an overestimate of light pollution. In approaching astronomy

groups, Shawn said that he learned that they measure light pollution not from the sky, but from the ground in terms of the number of stars not visible in a certain area.

In terms of compositional analysis and light intensity, Shawn said that there are four light intensity management areas within the study area. He referred to Pima County's lighting zones and mentioned that he had some complications because Oro Valley has different zones. However, he was able to equate Oro Valley values with Pima County's. Results show that there was direct LLNB selection for areas of lower light intensities, specifically, zone E1a. Zone E1a is described in Pima County's lighting code as areas in which preservation of naturally darkened environments is of paramount concern. Rich asked if any other studies show this same selection. Shawn said that no other studies were found that focused on urban areas. He has been in communication with others in the region about determining which models are the best. He said that LLNB may be selecting for lighting and not washes, and that washes just happen to be the darkest areas.

In terms of foraging areas, Shawn said that radio-marked bats exhibited high forage site fidelity. Forage area size was calculated with the fixed kernel method. The results from 2007 indicate a 400-hectare mean foraging area and results from 2008 indicate a mean foraging area of 505 hectares. When one looks at telemetry studies outside of urban areas, that range goes from about 100 hectares to 5000 hectares. He said that one can imagine that it is a resource-limiting situation. In those areas with more resources, the foraging area will be smaller. Shawn said that in those areas with scattered resources, the foraging area will be bigger because they are trying to get the same amount of resources in a larger area.

In terms of the night roosts, Shawn said that these are the roosts that AGFD staff identified as LLNB were moving through the area, foraging. They would stopover and rest for a while. Roost types included trees (non-natives such as tamarisks as well as natives) and barns or other buildings, mostly those with a preference for vaulted entrances. Basically, these were any dark areas that provided some substrate for the bats to cling to and hang from. Near the intersection of River Road and Stone Ave., an LLNB was found roosting in an abandoned house. There was one incidence where they tried to detect it and they followed it back to its day roost in Saguaro National Park. The next night, when they went to Saguaro National Park, they did not detect it. They generally got to the roost site to detect emergents 25 minutes before sunset, which would give them an hour-and-a-half to detect emergence. Emergence lasted half hour to 45 minutes after sunset.

In terms of lessons learned, Shawn said that, generally, LLNB use the Tucson Basin heavily between September and late October, but they have reports of LLNB occurring in the Tucson Basin year round. Shawn said that someone living near Saguaro National Park has detected LLNB in February. He said that there is a lethal temperature threshold just below 40 degrees, but if these roosts are providing some thermal protection, they can get through the freezing periods and persist within the urban area year round. No evaluation is currently being done on these roosts -- two of them being new -- and so they don't have temperature data, which would indicate whether or not they could persist during the colder months. Higher density developed areas were used by LLNB as foraging areas, but one would expect to see this as these areas have higher housing densities and, ultimately, have more feeders. Therefore, Shawn said that these

areas are good foraging areas. Compositional analysis for light intensity shows that LLNB select areas for lower light intensities, such as E1a, while avoiding areas of greater light intensity such as E2, E3. There were negative values for E2a and E3a, suggesting that LLNB were selecting against these areas.

In terms of Habitat Conservation Plan guidelines and actions, Shawn said that he offers these with caveats. This is because there is no historical evidence that indicates that, before Tucson was here, LLNB foraged in these areas. He said that we have to realize that during this time period at this elevation, there are no foraging resources for LLNB. There are reports of LLNB using prickly pears and some other foraging resources, but there are definitely not the same foraging resources in the Tucson Basin as one would find at higher elevations, such as agaves species. At this same time of year, one would expect these LLNB to forage at a higher elevation. During the study, Shawn said that he actually detected an LLNB on Mt. Lemmon foraging at a hummingbird feeder in September and October.

Given this caveat, Shawn said that results from the AGFD study suggest that future developments should avoid large washes when possible in urban areas. Another suggestion was that plans for higher density development projects should include open space, when possible. Light pollution should also be limited along potential flight corridors with similar characteristics. The idea from this is that, as the population grows from Sierra Vista to Phoenix, we might be creating a light wall for this species to move across from their known maternity roosts. There are different schools of thought about whether or not LLNB are going to those western roosts when very young or if the young and females come across the state.

In terms of the sex of the LLNB trapped and tracked, Shawn said that they caught both males and females. In 2007, they caught a lot more males than females. This is summarized in the forthcoming report. Shawn added that efforts should be made to monitor and protect known day roost locations, just as the maternity roosts are monitored and protected.

Another suggestion is that additional telemetry projects should be initiated to identify new roosts within the Tucson Basin and other areas in Southern Arizona. Shawn said that, potentially this fall, he'll start another project through a "Showing Success" grant awarded by the USFWS looking at LLNB movements south of Tucson (Sierra Vista, Nogales, and Green Valley) and using that information to identify new roosts.

Shawn said that there is a need for research on the effect of urbanization on foraging resources and behavior patterns as well as the implications of artificial food resources. Shawn said that this is something that has been lingering in the back of his mind. He wonders what the physiological effects of drinking sugar water are for LLNB. He said that they made an effort to collect pollen samples on the captured bats, but the collection effort was not continued due to problems with it. They recorded LLNB feeding on night-blooming cereus columnar cactus, a non-native species from South America. These bloom at the same time LLNB are in the Tucson Basin. So, LLNB may get protein resources from the pollen of such columnar cacti and energy resources from the carbohydrates of the sugar water.

Continue to monitor LLNB occupancy in the Tucson Basin and areas of foraging activity. Shawn said that he is currently working with the Town of Marana and encouraging them to continue maintaining their web site as a resource for people monitoring their hummingbird feeders. This allows AGFD the opportunity, if the web site yields reports of people observing LLNB within the urban cores of Marana and Tucson, to potentially trap and monitor the bat to understand its movements in the urban core area.

Trevor asked if, through the movement study, they were able to determine if the LLNB were coming to the Tucson Basin from the southeast or southwest. Shawn said that that is beyond the scope of the project. He added that that would involve banding bats for a mark-recapture study and that there is currently a controversy over the ethics of banding bats. He said that if he's able to continue the work of examining how they travel through less urbanized areas, they might be able to learn more about the direction from which the bats arrive in Tucson. He said that they did have a few bats that left the study area by way of Redington Pass. Shawn said that there is an historic roost in that area, which they visited last year. However, there was no evidence of LLNB at that site. There are other roosts on the south side of the Rincon Mountains near Benson and AGFD is aware of those.

Rich wondered if LLNB were foraging for protein-rich resources when they left the Tucson Basin and went over Redington Pass. Shawn said that that was quite possible. He added that they often see that phenomenon in birds, where they select a forage resource and then switch to another forage resource to balance nutrient requirements.

Jamie asked if the AGFD LLNB movement study had any implications for the Avra Valley HCP. Shawn said that they did not detect any LLNB movements going to Avra Valley. They tried to monitor LLNB in the Tucson Mountains and the bajada of the Tucson Mountains. He said that they had monitors in Avra Valley, but no reports of LLNB at these feeders. However, Shawn said that LLNB could still be using Avra Valley, especially as they move from known roosts, such as Old Mammon. Trevor said that perhaps Tucson Water could install some hummingbird feeders on City-owned lands in Avra Valley to see if the sugar water is being consumed during the night.

Shawn said that they did a project like this at Organ Pipe National Monument in 2003, where they set up an array of infrared video equipment, hung hummingbird feeders, and monitored inflorescenses of saguaros. No bats were detected using the hummingbird feeders, but they were detected at the inflorescences of saguaros.

Rich said that since 100% of the bats in the study used hummingbird feeders, he asked Shawn about their use of other foraging resources. Shawn said that they detected some foraging on non-native columnar cacti. Rich asked if Shawn thought that the foraging pattern was directed at houses and the washes adjacent to those houses and Shawn said yes, that LLNB appear to be selecting for areas that have hummingbird feeders. Shawn said that how they find the hummingbird feeders is unknown. He wonders if they are "keying in" on porches or are there olfactory cues. Ries asked if Shawn had given any thought to how LLNB learn to use hummingbird feeders, adding that he understands how hummingbirds find them, since they are red. Shawn said that is unknown and that LLNB have to constantly search for new foraging

resources as the blooming period shifts throughout a season. Ries said that he can understand evolution's role in LLNB learning to seek saguaro and agave flowers, but that doesn't explain hummingbird feeders. Ries wondered if the wing flutter of moths around porches or hummingbird feeders was similar to that of moths around agave flowers and provide cues to LLNB.

Avra Valley HCP: Monitoring Program

Jamie began by saying that the current focus for the City and TAC is to get beyond general ideas about long term monitoring in Avra Valley and begin to focus on specific details. This is to determine as many tasks and details prior to submitting an Incidental Take Permit as possible so that the City can better estimate the long-term costs. Jamie referred to a handout that lists some of the pressures, impacts, and possible monitoring activities to measure these. He noted that it is possible that no "Covered Activities" would actually occur during the duration of the Incidental Take Permit and, as such, monitoring should be commensurate with the level of impact as it is specifically planned to occur on those lands.

The handout indicated the monitoring activity – groups as "Level 1" efforts – that would occur if none of the "Covered Activities" occurred. For example, the perimeters would be visually inspected weekly for fence damage, illegal dumping, and other impacts. Jamie and Ries mentioned that new fencing involves installing cables along the fence to prevent vehicles from driving through it. Jamie mentioned that a weather station was installed at the Southern Avra Valley Storage and Recovery Project (SAVSARP) and this data would be part of the long-term monitoring as well as any flow height data recorded along the Brawley and Blanco Washes. He said that this information would be helpful in understanding what may be causing any declines in vegetation health, such as flooding or drought. Other "Level 1" monitoring efforts included documenting occurrences of wildfires and major flooding, documenting locations of invasive species and treating as feasible, and calculate changes in development and road density within two miles of the HCP planning area every five years.

Trevor suggested quantifying the changes in development and road density more frequently. Rich said that every two years would be good. Rich said that these habitats are not potentially developable now, but as Tucson Water needs to construct water facilities, then this may change. In the meantime, these lands will stay the way they are. They are deemed to be important for the woodland habitat, which is mainly composed of velvet mesquite. There is very little hydroriparian vegetation, but the woodland provides habitat for several of the Covered Species. Rich said that the main emphasis should be on protecting these areas from fire and non-native species invasion. He mentioned that at the last meeting, the MacArthur Board Technique was discussed as a means to measure the vertical structural diversity, which he has used in the past for his bird studies. So, all of the Level 1 monitoring is broad brush, but there are areas in the landscape that are more important than others. So, Rich said that some areas may deserve to be monitored more frequently than others. Doing the Level 1 monitoring without gathering information about the habitat is not sufficient because some of these areas need even a low level of monitoring, but at least some monitoring. Trevor wondered if Rich meant that remote sensing should be analyzed or if this would be done without any projects occurring that would pay for it. Rich said that field-based monitoring needs to occur since remote sensing cannot provide information on the vertical component of vegetation.

Trevor said that it would be good to gather cost estimates and see how the City feels about paying for a baseline study now. Rich agreed and said that, over a 5 or 10-year period there needs to be an on-the-ground review of these areas.

Trevor said that he likes that the boundaries are monitored weekly and wondered if installing permanent photopoints that are taken twice a year, such as in the early spring and after the monsoons start, would be worth exploring. Rich thought that the more intense monitoring would only need to focus on a fraction of the HCP Planning Area. Trevor said that, in addition to the weather station in the southern portion of Avra Valley, he recommends one in the northern portion, even if its not a City weather station. This would provide more of a valley-wide understanding of weather patterns. Trevor acknowledged that it could be a maintenance concern if it is located on an isolated farm, where it could be vandalized. Ries said that he couldn't recall the cost of the weather station at SAVSARP, but that it was quite high.

Jamie said, according to the draft document, that Level 2 monitoring would take place if the City moves forward with any Covered Activities within the HCP Planning Area. Prior to the longer term, Level 2 monitoring, brief, but more intensive Level 3 monitoring would occur, in which the City would reestablish the baseline habitat measurements. Pre-construction clearance surveys would occur for burrowing owls. Trevor said that pre-construction clearance surveys should occur for cactus ferruginous pygmy-owls (CFPO). Rich said he thinks CFPO pre-construction clearance surveys should only occur in CFPO breeding habitat. Dennis agreed with Rich, saying that these are transient areas for CFPO and that surveying would not provide much "bang for the buck." He added that if a bulldozer pulls up, that CFPO is not going to stay there and so direct take would not occur.

Jamie said that in terms of measuring vegetation structure, he looked into the MacArthur Board Technique and found that, in the Tucson Area, a related technique has been used that measures total vegetation volume. Dennis wondered if Guy would be able to help advise the TAC on monitoring techniques. Rich said that Bob Steidl would probably know what the latest version of this technique is. He mentioned that MacArthur pioneered the foliage height diversity measurement, which has been shown to correlate that with breeding bird species richness. Trevor said that the folks at the Sonoran Desert Network would probably know about the latest protocols. *[Action Item: OCSD staff request input on monitoring approaches from others outside of TAC]*

In reference to the handout and the reestablishing of the baseline under Level 3, Rich wondered when the baseline would be collected. He suggested that someone should prioritize the farms within the HCP Planning Area to determine which deserve more intense monitoring and then gather the baseline data just at those locations. Rich said that this would be important because if something catastrophic occurred, the TAC would know what was lost. He added that this baseline does not need to relate to statistical tests of long-term trends. Trevor said that he thinks statistical validity is important, but it costs more money. He added that power analysis would tell you that you need twice as many sites to monitor as you can afford. So, he said that he thinks there is some happy medium. Rich said that he is talking about first pass. He thinks that to be good stewards, the properties need to be ranked.

Jamie asked if TAC members were familiar with the Avra Valley baseline study commissioned by Tucson Water in 2006. The report was completed by Tucson Audubon Society and includes photo points, details about vegetative cover, and other characteristics of the lands. *[Action Item: OCSD staff upload Avra Valley baseline study and supplemental materials on HCP web pages and direct TAC to these documents.]* Marit said that, presumably, for any project planned in the HCP Planning Area, there will be many months of lead time. Ries said that normally for a big project, it would be roughly 3 years. However, he said that with the Central Avra Valley Storage and Recovery Project (CAVSARP), it was approximately 18 months from the beginning of design to project completion. He noted that this is extremely and unusually quick. Marit said that perhaps there could be a balance between gathering baseline data now and when a project is completed.

Dennis asked if there is a policy for public notification of a project being initiated. That is, he asked how the TAC would know that a project was going to happen in the Avra Valley HCP Planning Area? Ries said that, once the HCP is approved, there would need to be staff providing oversight so that the TAC and USFWS would be notified once a project is being considered. Otherwise, the project may not be announced until it goes to the City's Mayor and Council. He said that Dennis' point is a good one and that a mechanism needs to be in place to protect the interests of the HCP. He said he doesn't see any problems with this, but it probably should be formalized.

Paul asked about how the properties were chosen to be part of the HCP planning area. Jamie provided some background.

Rich, in referring to the handout, wondered whether the City should plan to irrigate the vegetation in the habitat set-asides. This is if climate change were to lengthen the drought or alter temperature and precipitation patterns enough to cause vegetation mortality. He then said that he would alter the handout by removing the fourth and fifth items under Level 1 ("Record weather/climate data. . ." and "Gather annual precip. and flow stage data. . .") and replace those with the third and fourth items from Level 2 ("Monitor set-aside areas for presence of invasive plant species" and "apply control measures to manage invasive plant species within set-aside areas."). However, he said that these should only be done on priority areas. Rich also suggested removing the first two items under Level 2 ("Survey total vegetative volume. . ." and "Calculate habitat area and patch distance. . . "). Rich said that the priority here is species movement through the woodland and it will be best through movement with good foliage height diversity. So those areas are identified and then the activity of the City is to measure, just visually, where invasive plants are encroaching into these areas so that fire doesn't destroy them. Basically, Rich said that the City should protect these areas from being destroyed and that's it.

Trevor wondered if the City could get credit for natural improvements to habitat over time. If this is the case, then it's more important to gather the baseline now. Rich said that since this is xero-riparian vegetation, the chance of the woodland improving is slight. So, he thinks the better goal is to protect the area from fire. His biggest concern is development occurring around these lands and then, hypothetically, kids playing and accidentally starting a fire.

Marit said that, in terms of writing the biological opinion for this HCP, she's not sure how the credit issue would work. However, if we say "This is what we have now and we will make every effort to protect it," she thinks she can analyze that. Trevor said that it would be good to estimate costs based on how statistically significant we want to be as well as how qualitative and how quantitative we want to be. He said that he thinks that the City Mayor and Council could be convinced to pay for this baseline study now. Then, reestablishing the baseline once projects come forward would be easier.

Jamie mentioned that Tucson Water commissioned a survey of buffelgrass on the Avra Valley lands that involved divided each property by quarter-section and documenting the percentage of infestation based on visual estimates.

Jamie referred to another handout that provided an example of one way in which the habitat patch size and distance between patches could be calculated over time. The concept of patch size being important was mentioned at a recent TAC meeting. The goal would be to maintain a certain acreage over time or certain average distance between patches. This would help inform the TAC if the size of the habitat increased or decreased over time.

Rich asked Ries if someone at Tucson Water would do the monitoring work and ensure that the terms of the permit are followed. Ries said that he doesn't know since Tucson Water has never completed an HCP before. He added that, normally, once a project is considered, then a Tucson Water employee, such as an engineer, determines all the applicable permits needed. This task would probably be given to someone already employed by Tucson Water. Rich thinks that a biological field position would be valuable to collect data for these properties.

4. Updates (continued)

In terms of the Greater Southlands HCP, Bill Zimmerman and John Wise arrived to answer questions about their written responses to TAC questions about the Lee Moore Wash Basin Management Study. Jamie said that there was TAC uncertainty about what would happen to riparian vegetation if the flow corridor concept goes into effect, causing development encroachment into the 100-year floodplains. Bill said that the intent of the flow corridor concept is to maintain the riparian vegetation in its natural state and it is the dominant location of where the discharge goes today. In terms of sediment balance, that is why the flow corridors would protect a minimum of a 10-year floodplain, adding that the 2, 5, and 10-year storms are the dominant events where the sediment flows. This is also maintained when regional detention basins are built, though there is currently no money to build these at this time. In terms of flow volume, there will be a little more as the floodplain is squeezed in. John said that up to the 10-year event and beyond in the distributary areas, these are the majority of the events that one would see. Therefore, that's where the existing riparian vegetation is. Because the 100-year floodplain shows flow depths on the fringe of half-a-foot deep, there is very little, if any, riparian vegetation there. Most of the critical areas in terms of riparian vegetation and sediment transport are within the flow corridor.

Rich said that in unencumbered areas, such as the San Pedro River, in one decade there will be flow in one area. Yet, in another decade, there will be flow in another area. Within the 100-year

floodplain is where the 10-year floodplain allows riparian vegetation to develop. Rich said that if the flow corridors are adopted, there will never be natural aggradation and jumping to another channel over time. Trevor said the flow corridor is much better than a concrete-lined channel, which are not uncommon in Tucson. Currently, Bill said that there are many examples of lack of planning where a channel from one development is picked up by another. From a maintenance perspective, it's a nightmare. So as part of the Lee Moore Study, they'd like to avoid this.

Ann asked if, as the smaller channels are designated to be filled and developed, it is likely that the water from these will be shunted to the flow corridor to discharge the flow. Bill said that's possible, but will depend on the engineering design of each parcel. Bill said that if the City were to adopt the Lee Moore Study, the City's watercourse protection regulations rules would remain. Ann said that she suspects that as the City revises its watercourse protection ordinances, keeping every single wash will not be feasible. So, the question is, if some intermediary channel is impacted, does it make sense that this water will be shunted into the flow corridor? If so, what would the constraints be that that added water can do to the flow corridor in terms of downstream flow elevation. Bill said that this is how the widths were determined. He continued by saying that if the flow corridor, as existing, is rated as 3000 cubic feet per second (cfs) and with development the volume were increased slightly, the channel narrowed, and some of the flows totaling 1000 cfs were cut-off, the project team assumed that the 1000 cfs would now be in the flow corridor. That's how the flow corridor width was established.

Ann said that it sounded like they were already anticipating additional flow in the flow corridors. Bill said that this is existing conditions and any development would have to ensure that it does not exceed those. Ann said that these developments still have to "bleed" runoff and so it seems that the Lee Moore Study is anticipating a net increase in the volume of water. She said that she has had an ongoing concern about the unanticipated consequences these piecemeal additions to the flow corridor may create and how to keep the increased volume hemmed in. She wondered what is to keep the channel from shifting around more when another 1000 cfs is added. Bill said that it can shift in the flow corridor. Ann said that if the flow corridor is only as wide as the 10-year floodplain width, then there is not a lot of room to maneuver. Bill said that in the distributary areas, there is a lot of room to maneuver because the 10-year floodplain is so wide. He said in the riverine areas of the Flato and Franco washes, there isn't a big difference in width between the 10-year and 100-year floodplain. Ann said that she has a hard time visualizing how this will occur if its done piecemeal. Bill said that that is the trick is for someone to look at this over the next 40 to 50 years to make sure that it makes sense and all ties together. Until he retires, Bill said that would be him.

Ann said that there is some headcutting on the west side of Old Nogales Highway and she wondered if that was moving its way up in the system. If so, she wondered if the Lee Moore Study project team had accounted for that in terms of grade control structures. Bill said that they hadn't come up with anything yet in terms of an engineered solution, such as grade control structures. They are considering several alternatives for that. A final, engineered solution would occur in a later stage of the Lee Moore Study.

Trevor asked Bill about the likelihood of a catastrophic event occurring that would cut a hole straight up through the Lee Moore Watershed. Bill said that that is unpredictable. In terms of the headcutting at Old Nogales Highway, he said that the railroad is arresting that to some extent.

Jamie, in reference to the written responses, said that it sounded like the increased water resources within the flow corridors could enhance and sustain riparian areas. Bill said that they were hoping that happens. Jamie said that, in talking with Matt Flick of the City's Development Services Department, he agreed with that concept, but said that it depended on the vegetation type. That is, small shrubs may not withstand the increased volume and velocity. Jamie mentioned a previous TAC meeting brainstorm idea of planting cacti (such as for a PPC pollination corridor) within these flow corridors. Trevor said that it's important to stick with the plant palette that already exists. Bill said that, as development occurs, mitigation may occur within the actual flow corridors.

In terms of Erosion Hazard Setbacks, Jamie said that the idea of using Erosion Hazard Setbacks as vegetation enhancement areas was mentioned at an earlier TAC meeting. Bill said that that is possible and that Pima County would prohibit structures from being built in the Erosion Hazard Setbacks. He said that requiring a certain plant palette be maintained in these Erosion Hazard Setbacks could be a condition of rezoning. Jamie said that the TAC has talked about the canopy of the riparian vegetation being important as habitat, but the possibility of a pollination corridor for PPC has also been discussed. This would involve a contiguous corridor of cacti, such as *cylindropuntia* spp., that are maintained and protected throughout the HCP Planning Area.

Trevor said that having a map of the potential Erosion Hazard Setbacks would be useful, then. Bill said that they are working on that in the next phase. Trevor said that this could be helpful in thinking about these pollination corridors to know if it contains enough upland in the system to provide that pollination corridor.

Trevor wondered if the Lee Moore Study will advocate that a certain percentage of the channel banks remain natural, while a certain percentage would contain constructed bank protection. Trevor added that he thinks it's important to maintain natural channel banks wherever possible. Bill said that the flow corridors have an average flow depth of three or four feet. Therefore, the amount of fill needed should only be 1 or 2 feet at the edge. So, bank protecting that will have minimal effects hydraulically in the floodplain. Bill added that there is a cost trade-off for the developer. While she or he may be able to get the development closer to the channel, more bank protection and fill will be required, which has a cost.

Ann asked about the time frame for putting the Lee Moore Study out for public review. Bill said that it will be released shortly.

Rich said that the TAC acknowledged early on that there would not be any effluent to grow hydroriparian species in these washes. So, it will primarily be mesquite and hackberry. He mentioned the idea of planting specific species in or next to these channels to provide corridors and wondered if harvesting rainwater from adjacent neighborhoods in these planting areas along the flow corridors could be used to help these and the riparian vegetation survive drought? Ann said that retention and detention basins are great opportunities for that. She said that, in the City,

staff members are trying to get developers to consider multiple functions for these, including planting meso-riparian species. With the City's commercial water harvesting ordinance going into effect next year, the City is working with a developer on some pilot studies of soil moisture sensors connected to the irrigation system. So, Ann said that there will likely be implementation of technology that is water conserving in terms of the amount of supplemental irrigation that is applied. Moreover, plants would still get the benefits of harvested rainwater. She said that she sees this opportunity occurring in landscape borders, detention basins, and regional detention basins. Ann said that if people are impacting a wash, City staff members try to get them to put their detention basin parallel to the outside of the wash and contiguous with the wash, so that there is contiguity of habitat. She added that, any time the wash is flowing, the detention basin has water in it.

Ann said that they are looking for win-win opportunities for the washes and developers, looking to create opportunities where there is additional water from the hardscape to create more habitat, even if it's not in the wash corridor, but next to it. She said that she sees the future as a moving target with climate change, the urban heat island, and changes in water flow exacerbating this uncertainty. Therefore, she thinks the most useful thing we can do is be alert and get in the adaptive management mode. If plants appear to be dying in a certain location, let them die and see what's living. That is, we should "go with the flow" with this as it unfolds. That's why having perpetual irrigation in place would help buffer these uncertainties and maintain a seed source.

5. Call to the Audience

Mike Cross said that he is familiar with some of the parcels adjacent to City-owned parcels in Avra Valley and he said that Jamie overlooked a major pressure on the worksheet he created. That pressure is continuous migrant traffic and associated border interdiction efforts. If a fire starts there, it won't be because of some kid and he said that he wouldn't let his kids go there after dark. He said he didn't know if that is something that the TAC can do anything about, but it is something that the TAC should be aware of.

Trevor said that there is a new State Land Commissioner. David Jacobs said that her name is Maria Baier and, since this was just recently announced, he only knows what he read in the press release.

7. Adjournment

The meeting was adjourned at 4:00 p.m.

Summary of Action Items:

- *OCSD staff request Sandy Wolf's 2006 nectar feeding bat study and send to TAC*
- *OCSD staff request input on monitoring approaches from others outside of TAC*
- *OCSD staff upload Avra Valley baseline study and supplemental materials on HCP web pages and direct TAC to these documents.*